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(54) **Sulfonamide derivatives**

Sulphonamid-Derivate

Dérivés de sulphonamide

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(56) References cited:
EP-A- 0 504 938 **FR-A- 2 490 632**

- **J. ENZYME INHIBITION vol. 3, no. 3 , 1990 , HARWOOD PUBLISHERS, NEW YORK, USA pages 195 - 201 T SASAKI ET AL 'Inhibitory effect of di- and tripeptideyl aldehydes on calpains and cathepsin'**

EP 0 623 627 B1

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a novel sulfonamide derivative. More particularly, it relates to a novel sulfonamide derivative or a salt thereof which shows a strong inhibitory activity against cysteine protease such as calpain, cathepsin B, cathepsin H, cathepsin L, papain.

2. Description of the Related Art

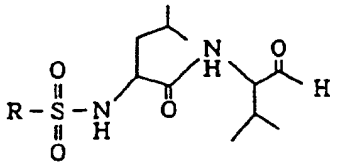
As in vivo action of cysteine protease, which papain, calpain, cathepsin and the like belong to, has been elucidated, its abnormal accentuation has been found to cause various diseases. Accordingly, cysteine protease inhibitors have been used as remedies for such diseases. For example, calpain inhibitors have been reported to be effective for animal model suffering from muscular dystrophy, cataract, myocardial infarction, stroke, while cathepsin inhibitors have been reported to be effective for metastasis of cancer, amyotrophia, osteoporosis, hypercalcemia and the like.

As cysteine protease inhibitors, peptidyl aldehyde derivatives are well known. For example, Leupeptin [Journal of Antibiotics, **22**, 183 (1969)], Strepin P-1 [Agricultural and Biological Chemistry, **49**, 799 (1985)], Staccopins P1, P2 [Agricultural and Biological Chemistry, **51**, 861 (1987)] and the like have been isolated from a microbial culture medium. In addition, various compounds have been synthesized. For example, MDL 28170 [Biochemical and Biophysical Research Communications, **157**, 1,117 (1988)] and Calpeptin [Journal of Enzyme Inhibition, **3**, 195 (1990)] are well known. Under the present conditions, most of the N-termini of these peptidyl aldehyde derivatives are free amino acid or amide derivative thereof or carbamate thereof, and few have been reported about N-terminal in the form of sulfonamide [Japanese Patent Application Laid-open No. 268145-1990; Journal of Antibiotics, **41**, 220 (1988); Journal of Biochemistry, **98**, 975 (1985); Developmental Biology, **105**, 246 (1984); Journal of Pharmacobio-Dynamics, **6**, 643 (1983); Japanese Patent Application Laid-open No. 054157-1982; Proceedings of National Academy of Science of the U.S. A., **76**, 1,131 (1979); Japanese Patent Application Laid-open No. 137951-1975]. The compounds having stronger cysteine protease inhibitory activity have been expected.

SUMMARY OF THE INVENTION

The present inventors have studied on compounds having strong cysteine protease inhibitory activity, and have attained the present invention.

That is, the point of the present invention is sulfonamide derivatives of the following general formula (I):



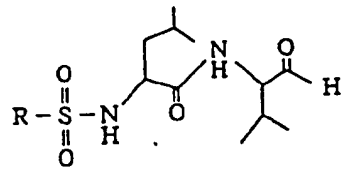
... (I)

(in the above general formula (I), R is C_{6-14} aryl or a heterocyclic residue each of which may have substituents) or the salt thereof.

DETAILED DESCRIPTION OF THE INVENTION

The present invention will be illustrated in detail.

The present compound is a sulfonamide derivative or a salt thereof represented by the following general formula (I):



... (I)

(in the above general formula (I), R is C_{6-14} aryl (phenyl, naphthyl, anthryl, etc.) which may have one or more substituents (substituents are selected from a group consisting of a halogen atom such as a fluorine atom, a chlorine atom, a bromine atom; C_{1-5} alkyl such as methyl, ethyl, propyl, iso-propyl, butyl, iso-butyl, sec-butyl, tert-butyl, pentyl, isopentyl, neopentyl; trifluoromethyl; C_{1-5} alkoxy such as methoxy, ethoxy, propoxy, iso-propoxy, butoxy, iso-butoxy, tert-butoxy, pentyloxy, iso-pentyloxy; C_{1-5} cyclic acetal residue such as methylenedioxy, ethylenedioxy, propylenedioxy, butylenedioxy; hydroxyl; C_{2-6} acyloxy such as acetoxy, propionyloxy, butyryloxy, valeryloxy; formyl; carboxyl; C_{2-6} alkoxycarbonyl such as methoxycarbonyl, ethoxycarbonyl, propoxycarbonyl, isopropoxycarbonyl, butoxycarbonyl, isobutoxycarbonyl, tert-butoxycarbonyl, pentyloxycarbonyl; oxo; C_{2-6} acyl such as acetyl, propionyl, butyryl, valeryl; amino; C_{1-5} monoalkylamino such as methylamino, ethylamino, propylamino, isopropylamino, butylamino, isobutylamino, tert-butylamino, pentylamino, iso-pentylamino; C_{2-10} dialkylamino such as dimethylamino, ethylmethylamino, diethylamino, methylpropylamino, diisopropylamino; C_{2-6} acylamino such as acetylamino, propionylamino, iso-propionylamino, butyrylamino, iso-butyrylamino, valerylamino; carbamoyl; and C_{2-6} alkylcarbamoyl such as methylcarbamoyl, ethylcarbamoyl, propylcarbamoyl, iso-propylcarbamoyl, butylcarbamoyl, tert-butylcarbamoyl, pentylcarbamoyl (hereinafter referred to as 'Group 1')) or a heterocyclic residue (a heterocyclic residue having 1 to 4 hetero atoms selected from a group consisting of oxygen, sulfur and nitrogen and having, in total, 5 to 10 atoms constituting a ring, for example, furyl, pyranyl, benzofuranyl, iso-benzofuranyl, chromenyl, chromanyl, iso-chromanyl, thiophenyl, benzothiophenyl, pyrrolyl, pyrrolinyl, pyrrolidinyl, imidazolyl, imidazolinyl, imidazolydinyl, pyrazolyl, pyrazolinyl, pyrazolidinyl, triazolyl, tetrazolyl, pyridyl, 1-oxopyridyl, piperidinyl, pyrazinyl, piperazinyl, pyrimidinyl, pyridazinyl, indolizinyl, indolyl, indolinyl, isoindolyl, iso-indolinyl, indazolyl, benzimidazolyl, purinyl, quinolizinyl, quionolyl, iso-quinolyl, phthalazinyl, naphthyridinyl, quinoxalinyl, quinazolinyl, cinnolinyl, pteridinyl, oxazolyl, oxazolidinyl, isoxazolyl, isoxazolidinyl, thiazolyl, thiazolidinyl, isothiazolyl, isothiazolidinyl, dioxolanyl, dioxanyl, dithianyl, morpholinyl, thiomorpholinyl, which may have one or more substituents (substituents are selected from 'Group 1'))).

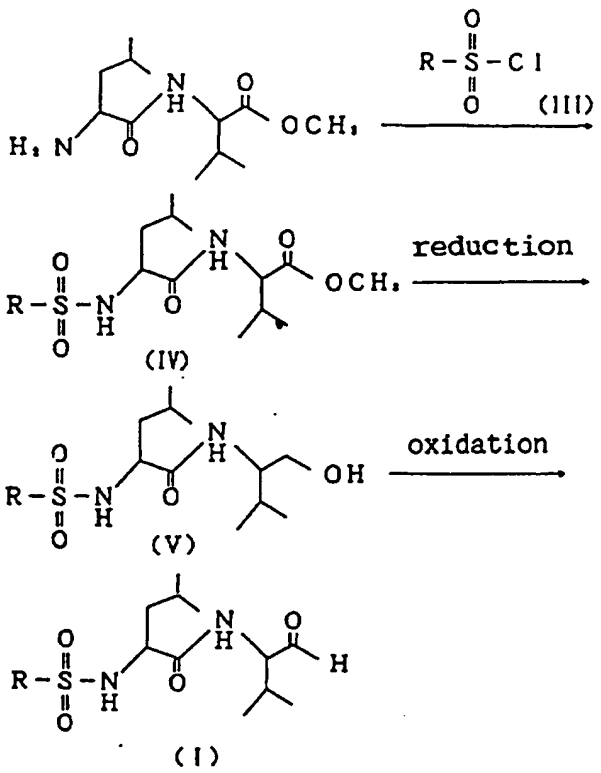
The preferred example of the compound of the present invention includes those wherein R is phenyl, 2-fluorophenyl, 3-fluorophenyl, 4-fluorophenyl, 2-chlorophenyl, 3-chlorophenyl, 4-chlorophenyl, 2,6-dichlorophenyl, 2,4,6-trichlorophenyl, 2-methylphenyl, 3-methylphenyl, 4-methylphenyl, 3,5-dimethylphenyl, 4-tert-butylphenyl, 4-trifluoromethylphenyl, 2-methoxyphenyl, 3-methoxyphenyl, 4-methoxyphenyl, 3,4-dimethoxyphenyl, 2-hydroxyphenyl, 3-hydroxyphenyl, 4-hydroxyphenyl, 4-acetoxyphenyl, 2-carboxyphenyl, 3-carboxyphenyl, 4-carboxyphenyl, 2-methoxycarbonylphenyl, 3-methoxycarbonylphenyl, 4-methoxycarbonylphenyl, 2-acetylphenyl, 3-acetylphenyl, 4-acetylphenyl, 2-dimethylaminophenyl, 3-dimethylaminophenyl, 4-dimethylaminophenyl, 1-naphthyl, 2-naphthyl, 4-chloro-1-naphthyl, 6-chloro-1-naphthyl, 3-chloro-2-naphthyl, 8-chloro-2-naphthyl, 4-dimethylamino-1-naphthyl, 8-dimethylamino-2-naphthyl, 2-pyridyl, 3-pyridyl, 4-pyridyl, 3-chloro-2-pyridyl, 2-chloro-3-pyridyl, 3-methyl-2-pyridyl, 2-methyl-3-pyridyl, 1-furyl, 2-furyl, 5-chloro-1-furyl, 1-thienyl, 2-thienyl, 4-quinolyl, 1-isoquinolyl, 5-isoquinolyl or 1-methyl-5-isoquinolyl.

Particularly preferred example includes the compounds in which R is a phenyl or a pyridyl group.

The sulfonamide derivative of the present invention represented by the above general formula (I) is converted into a pharmaceutically acceptable salt thereof. Particular embodiment of such salts includes a metal salt such as lithium, sodium, potassium, magnesium, calcium salt or ammonium salt such as ammonium, methylammonium, dimethylammonium, trimethylammonium, dicyclohexylammonium salt which may be formed in the presence of an acid group; and mineral acid salt such as hydrochloride, hydrobromide, sulfate, nitrate, phosphate or an organic acid salt such as methanesulfonate, benzenesulfonate, paratoluenesulfonate, acetate, propionate, tartrate, fumarate, maleate, malate, oxalate, succinate, citrate, benzoate, mandelate, cinnamate, lactate which may be formed in the presence of a basic group.

As configuration of the asymmetric carbon of the sulfonamide derivative represented by the above general formula (I), the compound may independently occur as R-, S- or RS-configuration.

The process for production of the present compound will be explained. The present sulfonamide derivatives can be produced, for example, by the following process:



(in the above general formula (I), R is as defined above).

Leucylvaline methyl ester represented by the above formula (II) is dissolved in a solvent such as tetrahydrofuran, ethyl acetate, dimethylformamide, dichloromethane, chloroform, 1,2-dichloroethane, and sulfonyl chloride of the above general formula (III) is added thereto in the presence of a base such as pyridine, triethylamine to afford a compound of the above general formula (IV). The ester of the compound (IV) is reduced with a reducing agent such as lithium aluminum hydride, lithium borohydride, sodium borohydride to give an alcohol (V), which is oxidized to aldehyde using an oxidizing agent such as sulfur trioxide/pyridine, oxalyl chloride/dimethyl sulfoxide, chromic acid/pyridine, potassium dichromate, manganese dioxide to give a sulfonamide derivative of the above general formula (I).

When the compound of the present invention is clinically employed, the ratio of the therapeutically active ingredient to the carrier may vary within the range of 1 to 90 % (by weight). For example, the present compound may be orally administered in the form of granule, powder, tablet, hard capsule, soft capsule, syrup, emulsion, suspension or other liquid for internal use. Alternatively, it may be administered as an injection by intravenous, intramuscular or subcutaneous administration. It may also be administered as a suppository. It may be formulated as powder for injection and prepared before use. Pharmaceutical organic or inorganic solid or liquid carrier or diluent suitable for oral, intestinal, parenteral administration may be used for preparation of the present medicine. Excipient used for production of solid preparation includes, for example, lactose, sucrose, starch, talc, cellulose, dextrin, kaolin, calcium carbonate. Liquid preparation for oral administration, that is, emulsion, syrup, suspension or other liquid for internal use may contain water or vegetable oil as a conventional inert diluent. Such preparation may also contain additives other than inert diluent, such as wetting agent, suspending aid, sweetener, flavor, colorant or preservative. It may be formulated as liquid preparation and filled in a capsule constituting of absorbable substance such as gelatin. Solvent or suspending agent used for production of parenteral preparation, i.e., injection, suppository or the like includes, for example, water, propylene glycol, polyethylene glycol, benzyl alcohol, ethyl oleate, lecithine and the like. A base used for suppository includes, for example, cacao butter, emulsified cacao butter, laurin tallow, witepsol and the like. The preparation may be compounded according to the conventional method.

The clinical dose of the present compound is generally 0.01 - 1,000 mg/day for an adult by oral administration. However, such dose may be preferably changed depending on age, pathema, symptom as needed. The present medicine of the above daily dosage may be administered once a day, or twice or three times a day with proper intervals. Alternatively, it may be intermittently administered.

When the present compound is used as an injection, a dose of 0.01 - 100 mg is desirably administered continuously or intermittently for an adult.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention will be illustrated in detail in the following syntheses and examples. The present invention is not construed to be limited by these syntheses and examples so long as they are within the scope of the present invention.

Synthesis 1

Production of N-phenylsulfonyl-L-leucyl-L-valine methyl ester

L-Leucyl-L-valine methyl ester hydrochloride (16.8 g) was dissolved in methylene chloride (500 ml), to which were added benzensulfonyl chloride (10.6 g) and triethylamine (16.7 ml). The resulting mixture was stirred at room temperature for 4 hours, then diluted hydrochloric acid was added. The solution was extracted with methylene chloride. The extract was sequentially washed with water, saturated aqueous sodium bicarbonate, saturated saline, and dried over magnesium sulfate and filtered. The filtrate was concentrated and purified by silica gel column chromatography (eluent: hexane : ethyl acetate = 2:1) to give 16.3 g of the objective compound as a crystal.

Yield; 71 %

NMR ($CDCl_3$, δ): 0.74 (d, J=6.9 Hz, 3H), 0.78 (d, J=6.4 Hz, 3H), 0.80 (d, J=6.9 Hz, 3H), 0.87 (d, J=6.6 Hz, 3H), 1.47 (m, 2H), 1.68 (m, 1H), 1.99 (m, 1H), 3.73 (s, 3H), 3.76 (m, 1H), 4.35 (dd, J=8.6 Hz, 4.8 Hz, 1H), 5.29 (d, J=8.4 Hz, 1H), 6.27 (d, J=8.2 Hz, 1H), 7.46 - 7.57 (m, 3H), 7.87 (ddd, J=5.9 Hz, 1.4 Hz, 1.4 Hz, 2H)

Synthesis 2

Production of N-phenylsulfoyl-L-leucyl-L-valinol

N-Phenylsulfonyl-L-leucyl-L-valine methyl ester obtained in Synthesis 1 (660 mg) was dissolved in tetrahydrofuran (15 ml) and sodium borohydride (163 mg) was added thereto. Subsequently, the reaction solution was heated to 55 °C, to which was added dropwise methanol (2.5 ml) over 12 minutes. The resulting mixture was further stirred at 55 °C for an hour. After the reaction solution was allowed to cool to room temperature, diluted hydrochloric acid was added. Half of the solution was distilled off under reduced pressure. The concentrate was extracted with methylene chloride. The extract was washed with saturated saline, dried over magnesium sulfate and filtered. The filtrate was concentrated and the resulting residue was reacted twice in the same manner as described above, then recrystallized from diethyl ether to give 373 mg of the product.

Yield; 61 %

NMR ($CDCl_3$, δ): 0.52 (d, J=6.3 Hz, 3H), 0.80 (d, J=6.2 Hz, 3H), 0.86 (d, J=6.8 Hz, 3H), 0.93 (d, J=6.8 Hz, 3H), 1.48 (m, 2H), 1.60 (m, 1H), 1.81 (m, 1H), 3.56 - 3.72 (m, 4H), 5.12 (d, J=5.5 Hz, 1H), 6.44 (d, J=8.8 Hz, 1H), 7.51 - 7.63 (m, 3H), 7.89 (ddd, J=6.1 Hz, 1.2 Hz, 1.2 Hz, 2H)

Example 1

Production of N-phenylsulfonyl-L-leucyl-L-valinal

Oxalyl chloride (53 µl) was dissolved in methylene chloride (4 ml) and cooled to -78 °C, then dimethyl sulfoxide (90 µl) was added thereto. The reaction solution was stirred at -78 °C for 15 minutes, then N-phenylsulfonyl-L-leucyl-L-valinol obtained in Synthesis 2 (176 mg) dissolved in methylene chloride (4 ml) and dimethyl sulfoxide (140 µl) was added dropwise. After 15 minutes, triethylamine (545 µl) was added to the reaction solution and warmed to room temperature. After stirring at room temperature for an hour, diluted hydrochloric acid was added to the reaction solution and extracted with methylene chloride. The extract was sequentially washed with water and saturated saline, then dried over magnesium sulfate and filtered. The filtrate was concentrated and purified by silica gel column chromatography (eluent: hexane : ethyl acetate = 2:1) to give 139 mg of the product (amorphous solid).

Yield; 80 %

IR: (KBr, cm^{-1}): 1,734, 1,655

NMR ($CDCl_3$, δ): 0.76 (d, J=6.4 Hz, 3H), 0.84 (d, J=7.2 Hz, 3H), 0.87 (d, J=6.6 Hz, 3H), 0.89 (d, J=6.8 Hz, 3H), 1.51 (m, 2H), 1.63 (m, 1H), 2.17 (m, 1H), 3.78 (ddd, J=8.4 Hz, 8.4 Hz, 5.3 Hz, 1H), 4.38 (dd, J=7.7 Hz, 4.4 Hz, 1H), 5.36 (d, J=8.1 Hz, 1H), 6.44 (d, J=7.3 Hz, 1H), 7.50 - 7.58 (m, 3H), 7.88 (dd, J=7.9 Hz, 1.2 Hz, 2H), 9.58 (s, 1H)

Example 2

Production of N-3-pyridylsulfonyl-L-leucyl-L-valinal

The title compound was prepared in the same manner as Syntheses 1 and 2 and Example 1.
Melting Point: 43 - 46 °C
IR: (KBr, cm^{-1}): 1,734, 1,664
NMR ($CDCl_3$, δ): 0.77 (d, J=6.4 Hz, 3H), 0.84 (d, J=6.3 Hz, 3H), 0.89 (d, J=6.9 Hz, 3H), 0.90 (d, J=6.6 Hz, 3H), 1.52 (dd, J=6.9 Hz, 6.9 Hz, 2H), 1.72 (m, 1H), 2.16 (m, 1H), 3.88 (dd, J=15.7 Hz, 7.6 Hz, 1H), 4.40 (dd, J=7.8 Hz, 4.6 Hz, 1H), 5.73 (d, J=8.9 Hz, 1H), 6.39 (d, J=8.2 Hz, 1H), 7.46 (dd, J=8.1 Hz, 4.9 Hz, 1H), 8.17 (d, J=8.1 Hz, 1H), 8.79 (d, J=4.0 Hz, 1H), 9.08 (br.s, 1H), 9.59 (s, 1H)

Experiment

Measurement of calpain inhibitory activity

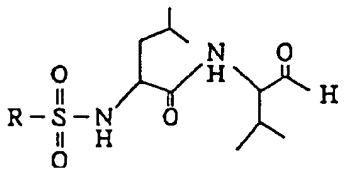
m-Calpin was purified from brains of rats according to the method described in a document (Journal of Biological Chemistry, **259**, 3,210 (1984)), and its inhibitory activity was measured according to the method described in a document (Journal of Biological Chemistry, **259**, 12,489 (1984)). The results are shown in Table 1. For comparison, inhibitory activity of leupeptin (N-terminus is in the form of amide) and calpeptin (N-terminus is in the form of carbamate) was also measured. Table 1 shows that the present compound strongly inhibits cysteine protease such as calpain.

Table 1

Compound	IC_{50} (μM)
Example 1	0.011
Example 2	0.0065
Leupeptin	0.36
Calpeptin	0.046

Claims

1. A sulfonamide derivative having the following general formula (I):



... (I)

(in the above general formula (I), R is C_{6-14} aryl or a heterocyclic residue each of which may have one or more substituents) or the salt thereof.

2. A compound of Claim 1, wherein the said substituent is selected from the group consisting of halogen atoms, C_{1-5} alkyl, trifluoromethyl, C_{1-5} alkoxy, C_{1-5} cyclic acetal, hydroxyl, C_{2-6} acyloxy, formyl, carboxyl, C_{2-6} alkoxycarbonyl, oxo, C_{2-6} acyl, amino, C_{1-5} monoalkylamino, C_{2-10} dialkylamino, C_{2-6} acylamino, carbamoyl and C_{2-6} alkylcarbamoyl.

3. A compound of Claim 2, wherein the said substituent which the C_{6-14} aryl may have is selected from the group consisting of halogen atoms, C_{1-5} alkyl, trifluoromethyl, C_{1-5} alkoxy, hydroxyl, C_{2-6} acyloxy, carboxyl, C_{2-6} alkoxycarbonyl, C_{2-6} acyl and C_{2-6} dialkylamino.

4. A compound of Claim 3, wherein the said substituent which the heterocyclic group may have is selected from a group consisting of halogen atoms and C_{1-5} alkyl.

5. A compound of Claim 1, wherein the heterocyclic residue has 1 to 4 hetero atoms selected from the group consisting of oxygen, sulfur and nitrogen, and total number of atoms constituting the ring is 5 to 10.

6. A compound of Claim 1, wherein the heterocyclic residue is furyl, pyranyl, benzofuranyl, iso-benzofuranyl, chromenyl, chromanyl, isochromanyl, thiophenyl, benzothiophenyl, pyrrolyl, pyrrolinyl, pyrrolidinyl, imidazolyl, imidazolinyl, imidazolydinyl, pyrazolyl, pyrazolinyl, pyrazolidinyl, triazolyl, tetrazolyl, pyridyl, 1-oxopyridyl, piperidinyl, pyrazinyl, piperazinyl, pyrimidinyl, pyridazinyl, indolizinyl, indolyl, indolinyl, isoindolyl, isoindolinyl, indazolyl, benzimidazolyl, purinyl, quinolizinyl, quionolyl, isoquinolyl, phthalazinyl, naphthyridinyl, quinoxalinyl, quinazolinyl, cinnolinyl, pteridinyl, oxazolyl, oxazolidinyl, isoxazolyl, isoxazolidinyl, thiazolyl, thiazolidinyl, isothiazolyl, isothiazolidinyl, dioxolanyl, dioxanyl, dithianyl, morpholinyl or thiomorpholinyl.

7. A compound of Claim 6, wherein the heterocyclic residue is furyl, pyridyl, thiophenyl, quinolyl or isoquinolyl.

8. A compound of Claim 1, wherein R is phenyl.

9. A compound of Claim 1, wherein R is pyridyl.

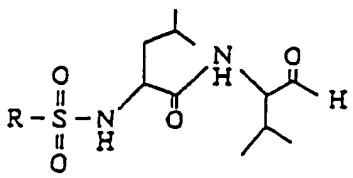
10. A pharmaceutical composition which comprises the compound of any one of Claims 1 to 9 and a pharmaceutically acceptable carrier.

11. A pharmaceutical composition of Claim 10 for diseases caused by abnormal accentuation of cysteine protease.

12. A pharmaceutical composition of Claim 11, wherein the diseases caused by abnormal accentuation of cysteine protease is muscular dystrophy, cataract, myocardial infarction, stroke, Alzheimer's disease, amyotrophia, osteoporosis or hypercalcemia.

Revendications

1. Dérivé de type sulfonamide de formule générale (I)



... (I)

(dans laquelle, R représente aryle en C_{6-14} ou un reste hétérocyclique, chacun de ces radicaux pouvant présenter un ou plusieurs substituants) ou un sel de celui-ci.

2. Composé selon revendication 1, dans lequel ledit substituant est choisi dans le groupe constitué des atomes d'halogène, des groupes alkyle en C_{1-5}, trifluorométhyle, alkoxy en C_{1-5}, acétal cyclique en C_{1-5}, hydroxyle, acyloxy en C_{2-6}, formyle, carboxyle, alkoxycarbonyle en C_{2-6}, oxo, acyle en C_{2-6}, amino, monoalkylamino en C_{1-5}, dialkylamino en C_{2-10}, acylamino en C_{2-6}, carbamoyle et alkylcarbamoyle en C_{2-6}..

3. Composé selon la revendication 2, dans lequel ledit substituant éventuellement porté par le groupe aryle en C_{6-14}, est choisi dans le groupe constitué des atomes d'halogène des groupes alkyle en C_{1-5}, trifluorométhyle, alkoxy en C_{1-5}, hydroxyle, acyloxy en C_{2-6}, carboxyle, alkoxycarbonyle en C_{2-6}, acyle en C_{2-6} et dialkylamino en C_{2-6}.

4. Composé selon la revendication 3, dans lequel ledit substituant éventuellement porté par le groupe hétérocyclique est choisi dans le groupe constitué des atomes d'halogène et des groupes alkyle en C_{1-5}.

5. Composé selon la revendication 1, dans lequel le reste hétérocyclique présente 1 à 4 hétéroatomes choisis dans

le groupe constitué de l'oxygène, du soufre, et de l'azote, le nombre total d'atomes formant le cycle étant compris entre 5 et 10.

6. Composé selon la revendication 1, dans lequel le reste hétérocyclique est furyle, pyranyle, benzofuranyle, isobenzofuranyle, chroménYle, chromanyle, isochromanyle, thiophényle, benzothiophényle, pyrrolyle, pyrrolinyle, pyrrolidinyle, imidazolyle, imidazolinyle, imidazolydinyle, pyrazolyle, pyrazolinyle, pyrazolidinyle, triazolyle, tétrazolyle, pyridyle, 1-oxopyridyle, pipéridinyle, pyrazinyle, pipérazinyle, pyrimidinyle, pyridazinyle, indolizinyle, indolyle, indolinyle, isoindolyle, isoindolinyle, indazolyle, benzimidazolyle, purinyle, quinolizinyle, quinolyle, isoquinolyle, phtalazinyle, naphtyridinyle, quinoxalinyle, quinazolinyle, cinnolinyle, ptéridinyle, oxazolyle, oxazolidinyle, isoxazolyle, isoxazolidinyle, thiazolyle, thiazolidinyle, isothiazolyle, isothiazolidinyle, dioxolanyle, dioxanyle, dithianyle, morpholinyle ou thiomorpholinyle.

7. Composé selon la revendication 6, dans lequel le reste hétérocyclique est furyle, pyridyle, thiophényle, quinolyle ou isoquinolyle.

8. Composé selon la revendication 1 dans lequel R est phényle.

9. Composé selon la revendication 1 dans lequel R est pyridyle.

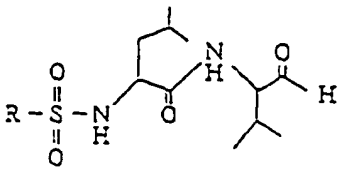
10. Composition pharmaceutique comprenant un composé selon l'une quelconque des revendications 1 à 9 et un véhicule pharmaceutiquement acceptable.

11. Composition pharmaceutique selon la revendication 10 pour le traitement de maladies causées par une accentuation anormale du taux de protéase à cystéine.

12. Composition pharmaceutique selon la revendication 11 dans laquelle les maladies causées par une accentuation anormale du taux de protéase à cystéine sont la dystrophie musculaire, la cataracte, l'infarctus du myocarde, une attaque, la maladie d'Alzheimer, l'amyotrophie, l'ostéoporose, ou une hypercalcémie.

Patentansprüche

1. Sulfonamidderivat der folgenden allgemeinen Formel (1)



... (I)

(in der obigen allgemeinen Formel (I) steht R für C_{6-14}-Aryl oder einen heterocyclischen Rest, die jeweils einen oder mehrere Substituenten aufweisen können) oder ein Salz hiervon.

2. Verbindung nach Anspruch 1, wobei der Substituent aus der Halogenatome, C_{1-5}-Alkyl, Trifluormethyl, C_{1-5}-Alkoxy, cyclisches C_{1-5}-Acetal, Hydroxyl, C_{2-6}-Acyloxy, Formyl, Carboxyl, C_{2-6}-Alkoxycarbonyl, Oxo, C_{2-6}-Acyl, Amino, C_{1-5}-Monoalkylamino, C_{2-10}-Dialkylamino, C_{2-6}-Acylamino, Carbamoyl und C_{2-6}-Alkylcarbamoyl umfassenden Gruppe gewählt ist.

3. Verbindung nach Anspruch 2, wobei der Substituent, welchen das C_{6-14}-Aryl aufweisen kann, aus der Halogenatome, C_{1-5}-Alkyl, Trifluormethyl, C_{1-5}-Alkoxy, Hydroxyl, C_{2-6}-Acyloxy, Carboxyl, C_{2-6}-Alkoxycarbonyl, C_{2-6}-Acyl und C_{2-6}-Dialkylamino umfassenden Gruppe gewählt ist.

4. Verbindung nach Anspruch 3, wobei der Substituent, welchen die heterocyclische Gruppe aufweisen kann, aus der Halogenatome und C_{1-5}-Alkyl umfassenden Gruppe gewählt ist.

5. Verbindung nach Anspruch 1, wobei der heterocyclische Rest 1 bis 4 Heteroatome aufweist, gewählt aus der

Sauerstoff, Schwefel und Stickstoff umfassenden Gruppe. und wobei die Gesamtanzahl der den Ring aufbauenden Atome 5 bis 10 beträgt.

6. Verbindung nach Anspruch 1, wobei der heterocyclische Rest Furyl, Pyranyl, Benzofuranyl, Isobenzofuranyl, Chromenyl, Chromanyl, Isochromanyl. Thiophenyl, Benzothiophenyl. Pyrrolyl. Pyrrolinyl, Pyrrolidinyl, Imidazolyl. Imidazolinyl, Imidazolydinyl, Pyrazolyl, Pyrazolinyl, Pyrazolidinyl, Triazolyl, Tetrazolyl. Pyridyl, 1-Oxopyridyl, Piperidinyl. Pyrazinyl, Piperazinyl. Pyrimidinyl, Pyridazinyl, Indolizinyl, Indolyl, Indolinyl, Isoindolyl, Isoindolinyl, Indazolyl. Benzimidazolyl, Purinyl, Chinolizinyl, Chionolyl, Isochinolyl, Phthalazinyl. Naphthyridinyl. Chinoxalinyl, Chinazolinyl, Cinnolinyl, Pteridinyl, Oxazolyl, Oxazolidinyl. Isoxazolyl. Isoxazolidinyl, Thiazolyl, Thiazolidinyl. Isothiazolyl, Isothiazolidinyl, Dioxolanyl. Dioxanyl, Dithianyl. Morpholinyl oder Thimorpholinyl ist.

7. Verbindung nach Anspruch 6, wobei der heterocyclische Rest Furyl, Pyridyl, Thiophenyl, Chinolyl oder Isochinolyl ist.

8. Verbindung nach Anspruch 1, worin R Phenyl ist.

9. Verbindung nach Anspruch 1, worin R Pyridyl ist.

10. Pharmazeutische Zusammensetzung, umfassend die Verbindung nach mindestens einem der Ansprüche 1 bis 9 und einen pharmazeutisch annehmbaren Träger.

11. Pharmazeutische Zusammensetzung nach Anspruch 10 für Krankheiten, welche durch eine abnormale Akzentuierung von Cysteinprotease verursacht sind.

12. Pharmazeutische Zusammensetzung nach Anspruch 11, wobei die durch abnormale Akzentuierung von Cysteinprotease vursachte Krankheit Muskeldystrophie, Katarakt, Myocardieinfarkt, Schlaganfall, Alzheimersche Krankheit, Amyotrophie, Osteoporose oder Hypercalcämie ist.